FACT SHEET FOR NPDES PERMIT NO. WA-002318-3

CITY OF CASHMERE PUBLICLY-OWNED TREATMENT WORKS

SUMMARY

The City of Cashmere is seeking reissuance of its NPDES Permit for its Publicly-Owned Treatment Works (POTW). The City is located in central Washington, approximately 10 miles west of Wenatchee, and straddles the Wenatchee River. The POTW provides wastewater collection and treatment for a combination of residential, commercial and industrial dischargers. Industrial users are the Tree Top, Inc. and Crunch Pak fruit processing facilities, two fruit packing facilities, and Liberty Orchards, a candy maker.

Cashmere's wastewater treatment facilities are located on the southeast end of the City, along the banks of the Wenatchee River. The City's main treatment plant and the City Lift Station are to the west of, and adjacent to the river; the pretreatment facility, consisting of a the Bulk Volume Fermenter (BVF), and the remaining two lift stations are on the east bank of the river. The facilities include an influent flow meter, sewage lift stations, the BVF system, aerated lagoons, transfer structures, disinfection equipment and a river outfall. Effluent is disinfected and continuously discharged to the river through a diffused outfall on the river bottom.

The City anticipates its main treatment plant will require a major upgrade during the proposed permit term, due to the anticipated lack of capacity of many major components and the need to comply with new environmental regulations. Major concerns include: capacity of the treatment lagoons to accommodate future organic and hydraulic loadings, compliance with State ground water quality regulations regarding leakage from the unlined lagoons and limited hydraulic capacity of outfall and diffuser structures. Design of the upgrade should also consider impacts of effluent BOD, TSS and temperature on the receiving water quality. In addition, the implementation of the TMDL wasteload allocations will require the City to meet strict limitations for phosphorous in the near future. The Permit will contain Special Condition, S9, which requires submission of a draft engineering plan, a final engineering report, approved plans and specifications and a construction quality assurance plan by the end of the permit term.

TABLE OF CONTENTS

INTRODUCTION

The Federal Clean Water Act (FCWA, 1972, and later modifications, 1977, 1981, and 1987) established water quality goals for the navigable (surface) waters of the United States. One of the mechanisms for achieving the goals of the Clean Water Act is the National Pollutant Discharge Elimination System of permits (NPDES permits), which is administered by the Environmental Protection Agency (EPA). The EPA has authorized the State of Washington to administer the NPDES permit program. Chapter 90.48 RCW defines the Department of Ecology's authority and obligations in administering the wastewater discharge permit program.

The regulations adopted by the State include procedures for issuing permits (Chapter 173-220 WAC), technical criteria for discharges from municipal wastewater treatment facilities (Chapter 173-221 WAC), water quality criteria for surface and ground waters (Chapters 173-201A and 200 WAC), and sediment management standards (Chapter 173-204 WAC). These regulations require that a permit be issued before discharge of wastewater to waters of the State is allowed. The regulations also establish the basis for effluent limitations and other requirements which are to be included in the permit. One of the requirements (WAC 173-220-060) for issuing a permit under the NPDES permit program is the preparation of a draft permit and an accompanying fact sheet. Public notice of the availability of the draft permit is required at least thirty days before the permit is issued (WAC 173-220-050). The fact sheet and draft permit are available for review (see Appendix A--Public Involvement of the fact sheet for more detail on the Public Notice procedures).

The fact sheet and draft permit have been reviewed by the Permittee. Errors and omissions identified in this review have been corrected before going to public notice. After the public comment period has closed, the Department will summarize the substantive comments and the response to each comment. The summary and response to comments will become part of the file on the permit and parties submitting comments will receive a copy of the Department's response. The fact sheet will not be revised. Comments and the resultant changes to the permit will be summarized in Appendix D--Response to Comments.

GENERAL INFORMATION	
Applicant	City of Cashmere
Facility Name and Address	City of Cashmere Publicly-Owned Treatment Works Riverfront Drive Cashmere, WA 98815
Type of Treatment	Industrial pretreatment facility consists of a Bulk Volume Fermenter (BVF), an anaerobic reactor. Main treatment plant includes three stabilization lagoons, chlorine disinfection, and river discharge through a perforated diffuser.
Discharge Location	Waterbody name: Wenatchee River, River Mile 8.6 Latitude: 47º 30' 39" N Longitude: 120º 26' 47" W
Water Body ID Number	WA-45-1010

BACKGROUND INFORMATION

The City of Cashmere is primarily an agricultural community located in Chelan County, approximately 8.5 river miles northwest of confluence of the Wenatchee and Columbia River. The community was incorporated in 1904, and has experienced relatively slow growth. The current population is approximately 2,980. The City is located at a bend in the Wenatchee River, with most of the City situated south and west of the river; the Tree Top plant, the pretreatment facility (BVF) and a small residential area located east of the river. The predominant industries are fruit producing, packing, and processing.

The City's water is supplied from wells and a surface water treatment facility on the Wenatchee River. Sewage collection, treatment and disposal are provided through a conventional gravity collection system, an industrial pretreatment unit, and aerated lagoons, followed by chlorine disinfection and a river discharge.

In August 1997, the City authorized preparation of a *Wastewater Treatment Facility Plan*, Phase 1. The *Facility Plan* was approved by the Department on February 2, 1999. The *Facility Plan* was based on the 1995 *Comprehensive Sewer Plan* and the 1997 *Chelan County Planning Report*. The *Facility Plan* was written in response to an Administrative Order issued by the Department in 1995. The Order noted that the City's treatment facilities had neared or exceeded NPDES permitted influent and discharge capacities on a number of occasions, and required the City to submit a plan to maintain adequate capacity. The *Comprehensive Sewer Plan* contains a description and evaluation of the existing and proposed sewer collection system improvements through 2012.

In 1999 the City requested an amendment to its urban growth boundary. This added approximately 96 acres to the west of the City, including the Chelan County Fairgrounds. The amendment resulted in a 30 percent increase in the population projections contained in the 1995 *Comprehensive Sewer Plan*. In November 1999 the Department received an amendment to the *Comprehensive Sewer Plan*, which describes measures the City took to accommodate the expanded wastewater service area. These measures included construction of the West Cashmere Lift Station and the addition of approximately 4.5 miles of sewer pipe. The amendment to the *Comprehensive Sewer Plan* was approved by the Department in November 1999. Expansion of the collection system was completed in September 2000.

The City's 1999 Facility Plan outlined tasks and construction activities to be undertaken in two phases, Phases I and II. The Phase I plan described and evaluated the existing facilities and forecasted future wastewater facility needs for the 20-year planning horizon. The Phase I plan also included evaluations, descriptions, cost estimates, and implementation schedules for proposed interim improvements and modifications necessary to bring the treatment facilities into compliance with current permit requirements. The BVF was repaired and renovated. Improvements included a grit chamber and a 2.0 million gallon sludge storage tank. Existing storm to sanitary sewer connections were removed.

The Phase II planning was delayed for numerous reasons. Chief among them was the ongoing Total Maximum Daily Load (TMDL) analysis of the Wenatchee River and development of wasteload allocations. Milestones for Phase II planning are included in the proposed permit. Planning milestones will require detailed evaluations, descriptions, cost estimates, and implementation schedules for the complete upgrade that will allow the facility to operate in compliance with permit requirements to the end of the 20-year planning horizon.

DESCRIPTION OF THE FACILITY

Collection System

The recent expansion, which was completed in 2000, resulted in construction of a fourth lift station and approximately 4.5 miles of new sewer pipe. The collection system accommodates demand in the newly incorporated portions of West Cashmere. The pre-existing conventional gravity sewer system consisted of three sewage lift stations and approximately 15.5 miles of sewers.

City Lift Station

All wastewater, except flow from the BVF, travels through the city lift station and then to the main treatment plant. Wastewater is collected in a wet well until a certain level is sensed by float switches and then the controller operates the three station pumps as necessary.

Previously when flow to the station exceeded capacity during heavy rain events and rapid snowmelt conditions, the sewer lines backed up and discharged through an overflow pipe to the river. In addition, the station was not equipped with a backup power source or any remote alarm system. In the event of any type of system failure or an extended power outage, raw sewage would be discharged to the river. A third serious deficiency was that the existing 8" force main which connects the lift station to the main treatment plant had insufficient capacity at high flow volumes (*Facility Plan*, p. 7). Replacement of this lift station, removal of storm to sanitary sewer connections and installation of a new force main were completed in 2000.

Museum Lift Station

This station serves all of the East Cashmere area, except Tree Top. Wastewater collects in a wet well and, when float switches activate the station pumps, is pumped to the collection system via a pipe across the Cottage Avenue Bridge. In December 2004 new pump and float systems were installed.

East Cashmere Lift Station

This lift station was originally designed to handle all wastewater discharges from the Tree Top facility; however, the station presently handles only the domestic wastewater portion of Tree Top's discharge and Bethlehem Construction's domestic wastewater. Wastewater collects in a wet well and, when float switches activate the station pumps, is pumped to the City Lift Station through a pipe buried in the Wenatchee riverbed. In 1995 the station was redesigned and reconstructed to accommodate the lower flow volumes and flow characteristics of present wastewater discharges.

West Cashmere Lift Station

This lift station was built to accommodate flows from new areas within the expanded urban growth boundary. The lift station contains a submersible-type pump station with two pumps and standby power.

Main Treatment Plant

The main treatment plant is located on City property adjacent to the Wenatchee River, approximately one mile southeast of the central business district. The lagoon treatment system portion of the plant consists of three unlined aerated lagoons configured to treat wastewater in series. Cell #1 receives municipal wastewater from Cashmere via the City Lift Station and Tree Top's pretreated wastewater directly from the BVF.

The 19-acre lagoon treatment system was originally designed as a 4'-to-5' foot deep, non-overflow, facultative (non-aerated) system. The system has had supplemental aeration added to it several times in efforts to increase treatment capacity. A significant amount of organic load

was removed from the system when the BVF went online in 1992. Lagoon system loading is now relatively light compared to the available treatment capacity and, consequently, the existing aeration units are only partially utilized however, in the near future loading are expected to increase dramatically due to a new industrial user.

The City removed an estimated 1,113 dry tons of sludge from Cell #1 in 2000. The City then removed an additional 2700 tons of sludge from Cell #1 in August of 2002.

Wastewater flows through gravity piping from treatment Cell #3 to the chlorine contact chamber, where it is disinfected prior to river discharge. This system consists of a large baffled concrete tank, a mixer, and a gas chlorine delivery system. Fecal coliform are monitored as flow leaves the chlorine contact chamber. Effluent is then pH adjusted and dechlorinated with a sulfur dioxide (SO_2) system installed in February 2000. The dechlorination system is not electronically linked to the chlorination system therefore; SO_2 is injected not to exceed the chlorine limit based on chlorine dosage.

Flow rate is measured and recorded at three locations. The two influent streams are measured at the City Lift Station and the BVF. Treatment plant effluent is metered at the discharge weir in the chlorine contact chamber. Daily totals are recorded at the BVF and effluent meters, and flow rate is continuously recorded at the City Lift Station.

The City had been adding hydrochloric acid during the summer to the effluent to control pH and had generally been able to keep effluent pH at or below 9.0 for the two years previous to the *Facility Plan*. Suspended solids cannot be as easily controlled. Suspended solids levels generally exceed permitted effluent limits during the three to four months of summer and early fall. BOD also exceeded permitted limits for three summer months in 1998. This trend was associated with the high levels of algae growth that occurred during summer. Installation of the cover over Cell #3 in the autumn of 1999 appears to have dramatically reduced algal growth and discharge of suspended solids. Since the cover has been installed, there have been no further compliance problems with BOD or TSS, related to algal growth.

Environmental deficiencies of an unknown magnitude include; the impacts of partially treated wastewater (that leaks from the unlined lagoons) on ground and surface water quality; and the capacity of the river outfall to accommodate increased discharge volumes.

Industrial Pretreatment Plant (BVF)

In 1992, an industrial pretreatment system was constructed to treat fruit processing wastewater from the Tree Top processing plant. The treatment process is anaerobic and the system is generally referred to as the BVF. The BVF was designed and constructed by ADI Systems, Inc., based on design loading projections provided by Tree Top. The BVF is located at the Tree Top processing plant site and consists of a 5.0 MG reactor tank, a control building, nutrient and

chemical control systems, mixing and recirculation equipment, ventilation systems, and gas discharge systems.

Raw wastewater is pumped from the processing plant into the BVF. A flow meter on the pump station discharge line is utilized to measure and record flow entering the BVF. Effluent flows to the main treatment plant through an 8" HDPE gravity force main (inverted siphon). There are two byproducts from the BVF treatment process. One byproduct is sludge. BVF-generated sludge is different from main treatment plant sludge because the BVF treats only fruit processing wastewater. Because of this, BVF sludge can be put to beneficial use without additional treatment required for a sludge derived from domestic sources, which is subject to biosolids regulation. The City holds a Beneficial Use Permit for the BVF sludge.

The other byproduct is biogas. During 2003, 63,045,538 cubic feet of gas was produced. Presently, this gas is burned using a flare system.

In 1995, ADI prepared a detailed evaluation of the operating capacity of the BVF, based on actual performance from 1992 to 1995. Actual performance was then compared to the original design criteria. It was noted that while hydraulic flow rates had been at or near design flow rate, the actual BVF BOD, COD and TSS loading rates were generally well below anticipated levels. Based on loading rates, the reactor is operating well below design capacity and, if necessary, additional treatment capacity is available. Effluent concentrations are generally very stable and much lower than anticipated (*Facility Plan,* Section 2, p. 8). See *WASTEWATER CHARACTERIZATION* section of this fact sheet for influent and effluent data (page 13) and *DESIGN CRITERIA* section for a summary of the BVF design criteria (page 14).

Improvements

Phase I

The Permittee has completed Phase I, or interim, improvements necessary to bring the POTW into compliance with current permit requirements. According to the 1999 Facility Plan the following improvements were expected to extend the life of the existing facility by 5 to 10 years. The results of the ground water monitoring program and additional loading from a new industrial user have since rendered the predicted life expectancy of the existing facility 1999 Facility Plan moot.

Phase I-First Priority Projects include:

1. Replacement of the City Lift Station (completed August 2000);

2. Removal of storm water discharges from the sanitary sewer (2001);

3. Installation of a cover over treatment lagoon #3 (completed in autumn 1999);

4. Installation of a dechlorination system (completed February 2000); and,

5. Implementation of a ground water monitoring program (implemented 2003).

Phase II

The City anticipates its main treatment plant will require a major upgrade during this phase, due to the need to comply with new environmental regulations and the potential lack of capacity of many major components as a new industrial user increases production. Major concerns include: capacity of the treatment lagoons to accommodate future organic and hydraulic loadings, compliance with State ground water quality regulations regarding leakage from the unlined lagoons and limited hydraulic capacity of the outfall and diffuser structures. Design of the Phase II upgrade should also consider impacts of effluent BOD, TSS and temperature on the receiving water quality. In addition, the implementation of the TMDL wasteload allocations will require the City to meet strict limitations for phosphorous in the near future. The Permit will contain Special Condition, S9, which requires submission of a draft engineering plan, a final engineering report, plans and specifications and a construction quality assurance plan by the end of the permit term.

Discharge Outfall

Secondary treated and disinfected effluent is discharged from the chlorine contact chamber via an outfall pipe with a 30-foot long perforated polyethylene diffuser. This outfall diffuser is anchored to the river bottom, laying perpendicular to the river flow. The outfall location is at Lat: 47° 30' 39", Long: 120° 26' 47", in the West ½ of Section 3, Township.23 N., Range.19 E.W.M. in Chelan County.

Residual Solids

Under contract, 2700 tons of sludge were removed from lagoon # 1 in 2002, by Boulder Farms in Mansfield, Washington.

The final use and disposal of sewage sludge from this facility is regulated by U.S. EPA under 40 CFR 503, and by Ecology under Chapter 173-308 WAC, "Biosolids Management". The disposal of other solid waste is under the jurisdiction of the Chelan County Health Department. The City anticipates removal of biosolids from the lagoons sometime in the near future.

PERMIT STATUS

The previous permit for this facility was issued on January 22, 2001. The previous permit placed effluent limitations on 5-day Biochemical Oxygen Demand (BOD_5), Total Suspended Solids

(TSS), pH, Fecal Coliform bacteria, and Total Residual Chlorine and Sulfites. Ammonia was monitored with a limit to be determined during the permit term. No limit was imposed.

An application for permit renewal was received by the Department on April 1, 2005 and accepted by the Department on April 5, 2005.

SUMMARY OF COMPLIANCE WITH THE PREVIOUS PERMIT

The facility received its last inspection on March 28, 2005.

During the history of the previous permit, the Permittee has remained in compliance, based on Discharge Monitoring Reports (DMRs) submitted to the Department and inspections conducted by the Department.

WASTEWATER CHARACTERIZATION

Pretreatment Plant (BVF)

Data presented in the table below reflect BVF influent and effluent characteristics from April 2002 through April 2005. Data are presented in the format of pounds per day (lbs/day) to facilitate comparison with the facility's design criteria (see page 14). The pretreatment plant's influent and effluent are characterized as follows:

BVF Wastewater Characterization

Parameter	Influent			Effluent		
	3-Year Average	Lowest Monthly Average	Highest Monthly Average	3-Year Average	Lowest Monthly Average	Highest Monthly Average
Flow (MGD)	0.251	0.091	0.345	NR	NR	NR
BOD_5 (lbs/day)	5675.3	1206.7	9935.3	142.1	12.1	1367.5
TSS (lbs/day)	3150.6	532.8	8954.2	821.3	22.5	4048
pH range	NR			Low pH = 6.4		High pH = 7.3

NR-Not Reported

During this 36 month period BOD removal rates for the BVF averaged 97.8% TSS; removal rates averaged 76.7%. Average BOD effluent concentrations varied substantially from 13 mg/L to 514 mg/L, with a median concentration of 22 mg/L. TSS concentrations varied significantly, ranging from 14 mg/L to 2101 mg/L, with a median of 111 mg/L.

Main Treatment Plant

Loadings to the POTW and the effluent were characterized for the three year period from April 2002 to April 2005. The data were taken from the DMRs submitted to the Department.

Main Treatment Plant Wastewater Characterization

Parameter	Influent	Effluent		
	Annual Average	Annual Average	Highest Monthly Average	Lowest Monthly Average
Flow (MGD)	City 0.340 BVF 0.251	0.443	0.566	0.258
BOD_5 (mg/L)	City 282.9 BVF 514	17.1	26	5.3
TSS (mg/L)	City 327.1 BVF 2101	19.1	34	9
Fecal Coliform (colonies per 100 mL)	NA	NA	NA	189
Total Residual Chlorine (mg/L)	NA	0.020	0.03	0.01
Ammonia Nitrogen (mg of N/L)	NA	5.5	11.2	1
Temperature, summer (ºC)	City 20.6	21.3	23	19
Temperature, winter (ºF)	City 10.1	2.3	3.0	1.0
Dissolved Oxygen	NA	5.5	3.4	8.0
pH range	NA	Low pH= 8.1		High pH= 9.0

PROPOSED PERMIT LIMITATIONS

Federal and State regulations require that effluent limitations set forth in a NPDES permit must be either technology- or water quality-based. Technology-based limitations for municipal discharges are set by regulation (40 CFR 133, and Chapters 173-220 and 173-221 WAC). Water quality-based limitations are based upon compliance with the Surface Water Quality Standards (Chapter 173-201A WAC), Ground Water Standards (Chapter 173-200 WAC), Sediment Quality Standards (Chapter 173-204 WAC) or the National Toxics Rule (Federal Register, Volume 57, No. 246, Tuesday, December 22, 1992.) The most stringent of these types of limits must be chosen for each of the parameters of concern. Each of these types of limits is described in more detail below.

The limits in this permit are based in part on information received in the application. The effluent constituents in the application were evaluated on a technology- and water quality-basis. The limits necessary to meet the rules and regulations of the State of Washington were determined and included in this permit. Ecology does not develop effluent limits for all pollutants that may be reported on the application as present in the effluent. Some pollutants are

not treatable at the concentrations reported, are not controllable at the source, are not listed in regulation, and do not have a reasonable potential to cause a water quality violation. Effluent limits are not always developed for pollutants that may be in the discharge but not reported as present in the application. In those circumstances the permit does not authorize discharge of the non-reported pollutants. Effluent discharge conditions may change from the conditions reported in the permit application. If significant changes occur in any constituent, as described in 40 CFR 122.42(a), the Permittee is required to notify the Department of Ecology. The Permittee may be in violation of the permit until the permit is modified to reflect additional discharge of pollutants.

DESIGN CRITERIA

In accordance with WAC 173-220-150 (1)(g), flows or waste loadings shall not exceed approved design criteria.

Section 5 of the *Facility Plan* contains existing and revised design criteria for the POTW (pp. 2, 3). The design criteria were adjusted to reflect greater operational experience with the system. The *Facility Plan* states that loadings from the City have exceeded expectations and loadings from the BVF have been less than anticipated.

City of Cashmere POTW Maximum Flow Design Criteria vs. Maximum Month

Parameter	Revised Flow Rate	3 Year Maximum	% of Design Criteria
BVF Maximum Month	0.440 MGD	0.345 MGD	78.4
Municipal Max. Month	0.573 MGD	0.394 MGD	68.8
Combined Max. Month	0.943 MGD	0.690 MGD*	73.2

* Combined flow for January 2004 from municipal and BVF

City of Cashmere POTW Influent Loadings Design Criteria vs. Maximum Month

Parameter	Revised Loading Rate	3 Year Maximum	% Design Criteria
BOD to BVF	24,500 lbs/day	8477.3	34.6
TSS to BVF	9,500 lbs/day	6891.1	72.5
Municipal BOD to Lagoon	5,000 lbs/day	1110.7	22.2
Industrial (BVF effluent) BOD to Lagoon	6,200 lbs/day	1367.5	22.1
Combined BOD to Lagoon	11,200 lbs/day	2478.2	22.1

TECHNOLOGY-BASED EFFLUENT LIMITATIONS

Municipal wastewater treatment plants are a category of discharger for which technology-based effluent limits have been promulgated by Federal and State regulations. These effluent limitations are given in the Code of Federal Regulations (CFR) 40 CFR Part 133 (Federal) and in Chapter 173-221 WAC (State). These regulations are performance standards that constitute all

known available and reasonable methods of prevention, control, and treatment for municipal wastewater.

The final technology-based effluent limits for BOD_5, TSS, Fecal Coliform Bacteria, and pH that were established in the previous permit remain unchanged in this permit. These limits remain unchanged because, although hydraulic and organic influent loadings between the BVF and main treatment plant have been revised, the total loadings design criteria for the main treatment plant were not modified.

The existing permit has a chlorine limit of 0.05 mg/L and the facility is able to comply with it. The proposed permit contains the same limit.

The following technology-based mass limits are based on WAC 173-220-130(3)(b) and 173-221-030(11)(b).

BOD average weekly effluent mass loadings (lbs/day) were calculated as the maximum monthly design flow (0.943 MGD) x Concentration limit (65 mg/L) x 8.34 (conversion factor) = mass limit 511 lb. /day.

BOD average monthly effluent mass loadings (lbs/day) were calculated as the maximum monthly design flow (0.943 MGD) x Concentration limit (45 mg/L) x 8.34 (conversion factor) = mass limit 354 lb. /day.

TSS average weekly effluent mass loadings (lbs/day) were calculated as the maximum monthly design flow (0.943 MGD) x Concentration limit (112 mg/L) x 8.34 (conversion factor) = mass limit 880 lb. /day.

TSS average monthly effluent mass loadings (lbs/day) were calculated as the maximum monthly design flow (0.943 MGD) x Concentration limit (75 mg/L) x 8.34 (conversion factor) = mass limit 590 lb. /day.

SURFACE WATER QUALITY-BASED EFFLUENT LIMITATIONS

In order to protect existing water quality and preserve the designated beneficial uses of Washington's surface waters, WAC 173-201A-060 states that waste discharge permits shall be conditioned such that the discharge will meet established Surface Water Quality Standards. The Washington State Surface Water Quality Standards (Chapter 173-201A WAC) is a State regulation designed to protect the beneficial uses of the surface waters of the State. Water quality-based effluent limitations may be based on an individual waste load allocation (WLA) or on a WLA developed during a basin-wide total maximum daily loading study (TMDL).

Numerical Criteria for the Protection of Aquatic Life

"Numerical" water quality criteria are numerical values set forth in the State of Washington's Water Quality Standards for Surface Waters (Chapter 173-201A WAC). They specify the levels of pollutants allowed in a receiving water while remaining protective of aquatic life. Numerical criteria set forth in the Water Quality Standards are used along with chemical and physical data for the wastewater and receiving water to derive the effluent limits in the discharge permit. When surface water quality-based limits are more stringent or potentially more stringent than technology-based limitations, they must be used in a permit.

Numerical Criteria for the Protection of Human Health

The State was issued 91 numeric water quality criteria for the protection of human health by the U.S. EPA (EPA 1992). These criteria are designed to protect humans from cancer and other disease and are primarily applicable to fish and shellfish consumption and drinking water from surface waters.

Narrative Criteria

In addition to numerical criteria, "narrative" water quality criteria (WAC 173-201A-030) limit toxic, radioactive, or deleterious material concentrations below those which have the potential to adversely affect characteristic water uses, cause acute or chronic toxicity to biota, impair aesthetic values, or adversely affect human health. Narrative criteria protect the specific beneficial uses of all fresh (WAC 173-201A-130) and marine (WAC 173-201A-140) waters in the State of Washington.

Antidegradation

The State of Washington's Antidegradation Policy requires that discharges into a receiving water shall not further degrade the existing water quality of the water body. In cases where the natural conditions of a receiving water are of lower quality than the criteria assigned, the natural conditions shall constitute the water quality criteria. Similarly, when receiving waters are of higher quality than the criteria assigned, the existing water quality shall be protected. More information on the State Antidegradation Policy can be obtained by referring to WAC 173-201A-070.

Critical Conditions

Surface water quality-based limits are derived for the waterbody's critical condition, which represents the receiving water and waste discharge condition with the highest potential for adverse impact on the aquatic biota, human health, and existing or characteristic water body uses.

Mixing Zones

The Water Quality Standards allow the Department of Ecology to authorize mixing zones around a point of discharge in establishing surface water quality-based effluent limits. Both "acute" and "chronic" mixing zones may be authorized for pollutants that can have a toxic effect on the aquatic environment near the point of discharge. The concentration of pollutants at the boundary of these mixing zones may not exceed the numerical criteria for that type of zone. Mixing zones can only be authorized for discharges that are receiving all known, available, and reasonable methods of prevention, control and treatment (AKART) and in accordance with other mixing zone requirements of WAC 173-201A-100.

The National Toxics Rule (EPA, 1992) allows the chronic mixing zone to be used to meet human health criteria.

Description of the Receiving Water

The facility discharges to the Wenatchee River, which is designated as a Class A receiving water in the vicinity of the outfall. Characteristic uses include the following:

Water supply (domestic, industrial, agricultural); stock watering; fish migration; fish rearing, spawning and harvesting; wildlife habitat; primary contact recreation; sport fishing; boating and aesthetic enjoyment; commerce and navigation. Water quality of this class shall meet or exceed the requirements for all or substantially all uses.

According to the 1998 303(d) list of water quality-impaired waterbodies, this segment of the Wenatchee River violates State's water quality standards for instream flow, pH and temperature. The TMDL process is well under way and wasteload allocations for phosphorous are expected to be established in the near future.

TMDL CONSIDERATIONS

The Wenatchee River TMDL is very likely to include wasteload allocations for phosphorous during the proposed permit cycle. This is in response to high pH values found in the Wenatchee River. Phosphorous stimulates plant growth, which in turn affects pH in the water column. In anticipation that a wasteload allocation will be imposed sometime during the proposed permit term, Special Conditions S1A. 2a and 2b, require the Permittee to meet a schedule of Compliance for meeting the wasteload allocation and to provide the Department with a Progress Report. Other parameters of TMDL concern, in addition to pH, are Pesticides, Fecal Coliform Bacteria, Temperature and Dissolved Oxygen.

TKN monitoring will be included in the proposed permit. The data collected is expected to provide the Department with data with which to assess the performance of the facility and characterize the relationship between TKN and effluent ammonia at this facility. Phosphorous,

believed to be a limiting factor in plant growth at this reach of the Wenatchee River, will also be required to be monitored.

Surface Water Quality Criteria

Applicable criteria are defined in Chapter 173-201A WAC for aquatic biota. In addition, U.S. EPA has promulgated human health criteria for toxic pollutants (EPA 1992). Criteria for this discharge are summarized below:

Table 5: Applicable Water Quality Criteria

Parameter	Criterion
Fecal Coliforms	100 organisms/100 mL maximum geometric mean
Dissolved Oxygen	8 mg/L minimum
Temperature	18 degrees Celsius maximum or incremental increases above background
pH	6.5 to 8.5 standard units
Turbidity	less than 5 NTUs above background
Toxics	No toxics in toxic amounts (see Appendix C for numeric criteria for toxics of concern for this discharge)

CONSIDERATION OF SURFACE WATER QUALITY-BASED LIMITS FOR NUMERIC CRITERIA

The only toxic pollutants expected to be present in the discharge are chlorine and ammonia. A preliminary determination for chlorine in the effluent to exceed the water quality criteria showed reasonable potential for violations to occur when the present permit was written. The data that determined the dilution factors was not documented in the previous permit but the dilution factors were incorrectly carried over into the present permit term which showed reasonable potential. New dilution factors were determined for the proposed permit using recent data. No reasonable potential for chlorine in the discharge to exceed the water quality criteria exists using the corrected dilution factors; however, anti-backsliding requires the present chlorine limit remain in effect.

Regarding ammonia, the present permit contains a Schedule of Compliance, which required the City to verify that the POTW's discharge is in compliance with the water quality standards for this parameter. It is now known that ammonia present in the effluent does not have potential to violate water quality criteria for this pollutant and therefore no limit is established. However, monitoring for ammonia will continue in the proposed permit.

Pollutant concentrations in the proposed discharge exceed water quality criteria with technology-based controls which the Department has determined to be AKART. A mixing zone is authorized in accordance with the geometric configuration, flow restriction, and other restrictions for mixing zones in Chapter 173-201A WAC and are defined below:

The length of the chronic and acute mixing zones shall extend downstream no greater than 300 feet and 30 feet, respectively. The chronic mixing zone shall extend upstream and no greater than 100 feet from the centerpoint of the outfall's discharge opening.

The dilution factors of effluent to receiving water that occur within these zones have been determined at the critical condition by the use of three different mathematical models, Cormix 4.3, Visual Plumes and RIVPLUM. (See Appendix C) computer software. The dilution factors imposed in this permit contain the most stringent dilution factor in the acute mixing zone, which was derived from the Department's RIVPLUME analysis tool.

Table 6: Applicable Dilution Factors

Mixing Zone Type	Acute	Chronic
Aquatic Life	23.6	113.9

The critical condition for the Wenatchee River is the seven day average low river flow with a recurrence interval of ten years (7Q10). Ambient data at critical conditions in the vicinity of the Cashmere outfall were taken from The Department's Environmental Assessment Program monitoring station located below Cashmere above the confluence of the Wenatchee and Columbia Rivers.

Table 7: Data Used for Reasonable Potential Determination

Parameter	Value used
7Q10 low flow	343 cfs
Velocity	0.48 ft/sec
Depth	1.5 feet
Width	230 feet
Roughness (Manning)	n=0.035
Temperature *	23.8^{o} C
pH (high)	8.2
Alkalinity	17.3
Total Ammonia-N	0.053 mg/L

* Maximum reported temperature August 2001

Temperature--The impact of the discharge on the temperature of the receiving water was modeled by CORMIC 4.3 mixing analysis at critical condition (See Appendix C). The receiving water temperature at the critical condition is 23.8 ^{o}C and the effluent temperature is 25 ^{o}C. The predicted resultant temperature at the boundary of the chronic mixing zone is 23.96^{o}C and the incremental rise is 0.16 ^{o}C.

WAC173-201A-030 (2) allows for Class A waters, when the ambient water temperature is above 18ºC, a temperature rise of 0.3 ºC rise at the edge of the chronic mixing zone from manmade sources.

$$0.16ºC < 0.30ºC$$

Or when ambient conditions are 18ºC or below the allowed temperature increase at the edge of the chronic mixing zone is determined by the following formula.

$$\Delta T = 28ºC / (18ºC_{\text{ambient}} + 7ºC)$$
$$\text{Allowed } \Delta T = 1.12ºC$$
$$0.16ºC < 1.12ºC$$

Under critical conditions there is no predicted violation of the Water Quality Standards for Surface Waters. Therefore, no effluent limitation for temperature was placed in the proposed permit.

pH--The impact of pH was modeled using the calculations from EPA, 1988. The input variables were dilution factor 23.6, upstream temperature 23.8^{o}C, upstream pH 8.2, upstream alkalinity 17.3 (as mg $CaCO_3$/L), effluent temperature 25^{o}C, effluent pH of 9, and effluent alkalinity 100 (as mg $CaCO_3$/L).

Under critical conditions there is no predicted violation of the Water Quality Standards for Surface Waters. Therefore, the technology-based effluent limitation for pH was placed in the permit.

Whole Effluent Toxicity

The Water Quality Standards for Surface Waters require that the effluent not cause toxic effects in the receiving waters. Many toxic pollutants cannot be detected by commonly available detection methods. However, toxicity can be measured directly by exposing living organisms to the wastewater in laboratory tests and measuring the response of the organisms. Toxicity tests measure the aggregate toxicity of the whole effluent, and therefore this approach is called whole effluent toxicity (WET) testing.

In accordance with WAC 173-205-040, the Permittee's effluent has been determined to have the potential to contain toxic chemicals. No wet testing will be required at this time because the only toxics present in the effluent are ammonia and chlorine, which have been addressed.

Human Health

Washington's water quality standards now include 91 numeric health-based criteria that must be considered in NPDES permits. These criteria were promulgated for the State by the U.S. EPA in its National Toxics Rule (Federal Register, Volume 57, No. 246, Tuesday, December 22, 1992).

The Department has determined that the applicant's discharge is unlikely to contain chemicals regulated for human health.

Sediment Quality

The Department has promulgated aquatic sediment standards (Chapter 173-204 WAC) to protect aquatic biota and human health. These standards state that the Department may require Permittees to evaluate the potential for the discharge to cause a violation of applicable standards (WAC 173-204-400).

The Department has determined through a review of the discharger characteristics and effluent characteristics that this discharge has no reasonable potential to violate the Sediment Management Standards.

GROUND WATER QUALITY LIMITATIONS

The Department has promulgated Ground Water Quality Standards (Chapter 173-200 WAC) to protect uses of ground water. Permits issued by the Department shall be conditioned in such a manner so as not to allow violations of those standards (WAC 173-200-100).

The Department is concerned that the City's unlined lagoons may be impacting the ground water beneath the ponds and the nearby Wenatchee River. In the existing permit the Permittee was required to conduct a Groundwater Quality Evaluation according to the State's Ground Water Quality Standards.

The required Ground Water Evaluation was conducted by the Permittee during the present permit term. The evaluation has demonstrated the lagoons are impacting groundwater quality. The Permittee will be required under the Schedule of Compliance to develop an engineering report to bring the treatment plant into compliance with the Surface and Groundwater Quality Standards.

COMPARISON OF EFFLUENT LIMITS WITH THE EXISTING PERMIT ISSUED JANUARY 22, 2001

Values in the Previous Permit Limits columns reflect the final effluent limits; the interim limits established in the companion order were significantly less stringent than the final limits. With

the exception of ammonia, effluent limits in this permit are unchanged from the final limits established in the previous permit.

Technology-Based Limits				
Parameter	**Previous Permit Limits**		**New Permit Limits**	
	Monthly Average	Weekly Average	Monthly Average	Weekly Average
BOD_5	45 mg/L 65 % removal 354 lbs/day	65 mg/L 511 lbs/day	45 mg/L 65 % removal 354 lbs/day	65 mg/L 511 lbs/day
TSS	75 mg/L 590 lbs/day	112 mg/L 880 lbs/day	75 mg/L 590 lbs/day	112 mg/L 880 lbs/day
Fecal Coliform	200/100 mL	400/100 mL	200/100 mL	400/100 mL
Residual Chlorine	Daily Maximum 0.05 mg/L 0.4 lbs/day		Daily Maximum 0.05 mg/L 0.4 lbs/day	
pH	6 to 9 standard units		6 to 9 standard units	

Water Quality-Based Limits			
Previous Permit Limits		**New Permit Limits**	
Total Ammonia	None	Total Ammonia	None

MONITORING REQUIREMENTS

Monitoring, recording, and reporting are required (WAC 173-220-210 and 40 CFR 122.41) to verify that the treatment process is functioning correctly and the effluent limitations are being achieved.

Monitoring of the final effluent is required for Flow, BOD, TSS, Temperature, pH, D.O., Residual Chlorine, Sulfites, Ammonia, TKN, Phosphorus and Fecal Coliform is being required to further characterize the effluent. These pollutant(s) could have a significant impact on the quality of the surface water.

Required influent monitoring consists of Flow for municipal and industrial sources, pH, Temperature, BOD, and TSS.

The City owned and maintained BVF influent and effluent will be required to be monitored for Flow, pH, Temperature, BOD and TSS.

The monitoring schedule is detailed in the proposed permit under Special Condition S2. Specified monitoring frequencies take into account the quantity and variability of discharge, the treatment method, past compliance, significance of pollutants, and cost of monitoring.

The City has requested a reduction in the monitoring frequency of BOD and TSS from twice a week to once a week for all influent and effluent monitoring stations. The Department agrees that a reduction in frequency is warranted based upon the coefficient of variation and/or the percentage of the design criteria the current loading rates consume. In addition the Department has reviewed the monitoring frequencies for pH, Temperature, DO and Residual Chlorine and has found a reduction from five times a week to twice a week to be appropriate for the same reasons. The required monitoring frequency is consistent with agency guidance given in the current version of the Department's *Permit Writer's Manual*.

LAB ACCREDITATION

With the exception of certain parameters the permit requires all monitoring data to be prepared by a laboratory registered or accredited under the provisions of Chapter 173-50 WAC, *Accreditation of Environmental Laboratories.* The City of Cashmere Wastewater Treatment Plant is accredited for General Chemistry and Microbiology

OTHER PERMIT CONDITIONS

REPORTING AND RECORDKEEPING

The provisions of Special Condition S3. are based on the authority to specify any appropriate reporting and recordkeeping requirements to prevent and control waste discharges (WAC 173-220-210).

PREVENTION OF FACILITY OVERLOADING

Overloading of the treatment plant is a violation of the terms and conditions of the permit. To prevent this from occurring, RCW 90.48.110 and WAC 173-220-150 require the Permittee to take the actions detailed in Special Condition S4. to plan expansions or modifications before existing capacity is reached and to report and correct conditions that could result in new or increased discharges of pollutants. Special Condition S4. restricts the amount of flow.

The last Inflow and Infiltration Report (I&I) and Wasteload Assessment where received at the Department on September 24, 2002. A second set of submittals was required with the application for permit renewal but in light of the pending facility upgrade Engineering Report (ER), due August 31, 2006, a later date for the required submittals is appropriate. The ER is required to address future growth and industrial capacity as well as the means with which to meet wasteload allocation associated with the TMDL.

OPERATION AND MAINTENANCE (O&M)

The proposed permit contains Special Condition S5. as authorized under RCW 90.48.110, WAC 173-220-150, Chapter 173-230 WAC, and WAC 173-240-080. It is included to ensure proper operation and regular maintenance of equipment, and to ensure that adequate safeguards are taken so that constructed facilities are used to their optimum potential in terms of pollutant capture and treatment.

RESIDUAL SOLIDS HANDLING

To prevent water quality problems the Permittee is required in Special Condition S7. to store and handle all residual solids (grit, screenings, scum, sludge, and other solid waste) in accordance with the requirements of RCW 90.48.080 and State Water Quality Standards.

The final use and disposal of sewage sludge from this facility is regulated by U.S. EPA under 40 CFR 503, and by Ecology under Chapter 70.95J RCW and Chapter 173-308 WAC. The disposal of other solid waste is under the jurisdiction of the Chelan County Health Department.

FEDERAL AND STATE PRETREATMENT PROGRAM REQUIREMENTS

Under the terms of the addendum to the "Memorandum of Understanding between Washington Department of Ecology and the United States Environmental Protection Agency, Region 10" (1986), the Department of Ecology (Department) has been delegated authority to administer the Pretreatment Program (i.e. act as the Approval Authority for oversight of delegated Publicly Owned Treatment Works (POTWs)). Under this delegation of authority, the Department has exercised the option of issuing wastewater discharge permits for significant industrial users discharging to POTWs which have not been delegated authority to issue wastewater discharge permits.

WASTEWATER PERMIT REQUIRED

RCW 90.48 and WAC 173-216-040 require SIUs to obtain a permit prior to discharge of industrial waste to the Permittee's sewerage system. This provision prohibits the POTW from accepting industrial wastewater from any such dischargers without authorization from the Department.

DUTY TO ENFORCE DISCHARGE PROHIBITIONS

This provision prohibits the POTW from authorizing or permitting an industrial discharger to discharge certain types of waste into the sanitary sewer. The first portion of the provision prohibits acceptance of pollutants which cause pass through or interference. The definitions of pass through and interference are in Appendix B of the fact sheet.

The second portion of this provision prohibits the POTW from accepting certain specific types of wastes, namely those which are explosive, flammable, excessively acidic, basic, otherwise corrosive, or obstructive to the system. In addition wastes with excessive BOD, petroleum based oils, or which result in toxic gases are prohibited to be discharged. The regulatory basis for these prohibitions is 40 CFR Part 403, with the exception of the pH provisions which are based on WAC 173-216-060.

The third portion of this provision prohibits certain types of discharges unless the POTW receives prior authorization from the Department. The discharges include cooling water in significant volumes, stormwater and other direct inflow sources, and wastewaters significantly affecting system hydraulic loading, which do not require treatment.

GENERAL CONDITIONS

General Conditions are based directly on State and Federal law and regulations and have been standardized for all individual municipal NPDES permits issued by the Department.

PERMIT ISSUANCE PROCEDURES

PERMIT MODIFICATIONS

The Department may modify this permit to impose numerical limitations, if necessary to meet Water Quality Standards, Sediment Quality Standards, or Ground Water Standards, based on new information obtained from sources such as inspections, effluent monitoring, outfall studies, and effluent mixing studies.

The Department may also modify this permit as a result of new or amended State or Federal regulations.

RECOMMENDATION FOR PERMIT ISSUANCE

This proposed permit meets all statutory requirements for authorizing a wastewater discharge, including those limitations and conditions believed necessary to protect human health, aquatic life, and the beneficial uses of waters of the State of Washington. The Department proposes that this permit be issued for 5 years.

REFERENCES FOR TEXT AND APPENDICES

Environmental Protection Agency (EPA)
1992. National Toxics Rule. Federal Register, V. 57, No. 246, Tuesday, December 22, 1992.

1991. Technical Support Document for Water Quality-based Toxics Control. EPA/505/2-90-001.

1988. Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling. USEPA Office of Water, Washington, D.C.

1985. Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Ground Water. EPA/600/6-85/002a.

1983. Water Quality Standards Handbook. USEPA Office of Water, Washington, D.C.

Metcalf and Eddy.

1991. Wastewater Engineering, Treatment, Disposal, and Reuse. Third Edition.

Tsivoglou, E.C., and J.R. Wallace.

1972. Characterization of Stream Reaeration Capacity. EPA-R3-72-012. (Cited in EPA 1985 op.cit.)

Washington State Department of Ecology.

Laws and Regulations(http://www.ecy.wa.gov/laws-rules/index.html)

Permit and Wastewater Related Information
(http://www.ecy.wa.gov/programs/wq/wastewater/index.html

Washington State Department of Ecology.

1994. Permit Writer's Manual. Publication Number 92-109

Water Pollution Control Federation.

1976. Chlorination of Wastewater.

Wright, R.M., and A.J. McDonnell.

1979. In-stream Deoxygenation Rate Prediction. Journal Environmental Engineering Division, ASCE. 105(EE2). (Cited in EPA 1985 op.cit.)

APPENDIX A -- PUBLIC INVOLVEMENT INFORMATION

The Department has tentatively determined to reissue a permit to the applicant listed on page 1 of this fact sheet. The permit contains conditions and effluent limitations which are described in the rest of this fact sheet.

The Department will publish a Public Notice of Draft (PNOD) on September 14, 2005, in the Leavenworth Echo and Cashmere Valley Record to inform the public that a draft permit and fact sheet are available for review. Interested persons are invited to submit written comments regarding the draft permit. The draft permit, fact sheet, and related documents are available for inspection and copying between the hours of 8:00 a.m. and 5:00 p.m. weekdays, by appointment, at the regional office listed below. Written comments should be mailed to:

Water Quality Permit Coordinator
Department of Ecology
Central Regional Office
15 West Yakima Avenue, Suite 200
Yakima, WA 98902

Any interested party may comment on the draft permit or request a public hearing on this draft permit within the 30 day comment period to the address above. The request for a hearing shall indicate the interest of the party and the reasons why the hearing is warranted. The Department will hold a hearing if it determines there is a significant public interest in the draft permit (WAC 173-220-090). Public notice regarding any hearing will be circulated at least 30 days in advance of the hearing. People expressing an interest in this permit will be mailed an individual notice of hearing (WAC 173-220-100).

Comments should reference specific text followed by proposed modification or concern when possible. Comments may address technical issues, accuracy and completeness of information, the scope of the facility's proposed coverage, adequacy of environmental protection, permit conditions, or any other concern that would result from issuance of this permit.

The Department will consider all comments received within 30 days from the date of public notice of draft indicated above, in formulating a final determination to issue, revise, or deny the permit. The Department's response to all significant comments is available upon request and will be mailed directly to people expressing an interest in this permit.

Further information may be obtained from the Department by telephone, 509/457-7105, or by writing to the address listed above.

This permit and fact sheet were written by Richard Marcley.

APPENDIX B -- GLOSSARY

Acute Toxicity--The lethal effect of a pollutant on an organism that occurs within a short period of time, usually 48 to 96 hours.

AKART-- An acronym for "all known, available, and reasonable methods of prevention, control, and treatment".

Ambient Water Quality--The existing environmental condition of the water in a receiving water body.

Ammonia--Ammonia is produced by the breakdown of nitrogenous materials in wastewater. Ammonia is toxic to aquatic organisms, exerts an oxygen demand, and contributes to eutrophication. It also increases the amount of chlorine needed to disinfect wastewater.

Average Monthly Discharge Limitation --The highest allowable average of daily discharges over a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month (except in the case of fecal coliform). The daily discharge is calculated as the average measurement of the pollutant over the day.

Average Weekly Discharge Limitation -- The highest allowable average of daily discharges over a calendar week, calculated as the sum of all daily discharges measured during a calendar week divided by the number of daily discharges measured during that week. The daily discharge is calculated as the average measurement of the pollutant over the day.

Best Management Practices (BMPs)--Schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the pollution of waters of the State. BMPs include treatment systems, operating procedures, and practices to control: plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. BMPs may be further categorized as operational, source control, erosion and sediment control, and treatment BMPs.

BOD_5--Determining the Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of organic material present in an effluent that is utilized by bacteria. The BOD_5 is used in modeling to measure the reduction of dissolved oxygen in a receiving water after effluent is discharged. Stress caused by reduced dissolved oxygen levels makes organisms less competitive and less able to sustain their species in the aquatic environment. Although BOD is not a specific compound, it is defined as a conventional pollutant under the Federal Clean Water Act.

Bypass--The intentional diversion of waste streams from any portion of a treatment facility.

CBOD5 – The quantity of oxygen utilized by a mixed population of microorganisms acting on the nutrients in the sample in an aerobic oxidation for five days at a controlled temperature of 20 degrees Celsius, with an inhibitory agent added to prevent the oxidation of nitrogen compounds. The method for determining CBOD5 is given in 40 CFR Part 136.

Chlorine--Chlorine is used to disinfect wastewaters of pathogens harmful to human health. It is also extremely toxic to aquatic life.

Chronic Toxicity--The effect of a pollutant on an organism over a relatively long time, often 1/10 of an organism's lifespan or more. Chronic toxicity can measure survival, reproduction or growth rates, or other parameters to measure the toxic effects of a compound or combination of compounds.

Clean Water Act (CWA)--The Federal Water Pollution Control Act enacted by Public Law 92-500, as amended by Public Laws 95-217, 95-576, 96-483, 97-117; USC 1251 et seq.

Combined Sewer Overflow (CSO)--The event during which excess combined sewage flow caused by inflow is discharged from a combined sewer, rather than conveyed to the sewage treatment plant because either the capacity of the treatment plant or the combined sewer is exceeded.

Compliance Inspection - Without Sampling--A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations.

Compliance Inspection - With Sampling--A site visit to accomplish the purpose of a Compliance Inspection - Without Sampling and as a minimum, sampling and analysis for all parameters with limits in the permit to ascertain compliance with those limits; and, for municipal facilities, sampling of influent to ascertain compliance with the percent removal requirement. Additional sampling may be conducted.

Composite Sample--A mixture of grab samples collected at the same sampling point at different times, formed either by continuous sampling or by mixing a minimum of four discrete samples. May be "time-composite"(collected at constant time intervals) or "flow-proportional" (collected either as a constant sample volume at time intervals proportional to stream flow, or collected by increasing the volume of each aliquot as the flow increased while maintaining a constant time interval between the aliquots).

Construction Activity--Clearing, grading, excavation and any other activity which disturbs the surface of the land. Such activities may include road building, construction of residential houses, office buildings, or industrial buildings, and demolition activity.

Continuous Monitoring –Uninterrupted, unless otherwise noted in the permit.

Critical Condition--The time during which the combination of receiving water and waste discharge conditions have the highest potential for causing toxicity in the receiving water environment. This situation usually occurs when the flow within a water body is low, thus, its ability to dilute effluent is reduced.

Dilution Factor--A measure of the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. Expressed as the inverse of the effluent fraction e.g., a dilution factor of 10 means the effluent comprises 10% by volume and the receiving water 90%.

Engineering Report--A document which thoroughly examines the engineering and administrative aspects of a particular domestic or industrial wastewater facility. The report shall contain the appropriate information required in WAC 173-240-060 or 173-240-130.

Fecal Coliform Bacteria--Fecal coliform bacteria are used as indicators of pathogenic bacteria in the effluent that are harmful to humans. Pathogenic bacteria in wastewater discharges are controlled by disinfecting the wastewater. The presence of high numbers of fecal coliform bacteria in a water body can indicate the recent release of untreated wastewater and/or the presence of animal feces.

Grab Sample--A single sample or measurement taken at a specific time or over as short period of time as is feasible.

Industrial User-- A discharger of wastewater to the sanitary sewer which is not sanitary wastewater or is not equivalent to sanitary wastewater in character.

Industrial Wastewater--Water or liquid-carried waste from industrial or commercial processes, as distinct from domestic wastewater. These wastes may result from any process or activity of industry, manufacture, trade or business, from the development of any natural resource, or from animal operations such as feed lots, poultry houses, or dairies. The term includes contaminated storm water and, also, leachate from solid waste facilities.

Infiltration and Inflow (I/I)--"Infiltration" means the addition of ground water into a sewer through joints, the sewer pipe material, cracks, and other defects. "Inflow" means the addition of precipitation-caused drainage from roof drains, yard drains, basement drains, street catch basins, etc., into a sewer.

Interference -- A discharge which, alone or in conjunction with a discharge or discharges from other sources, both:

Inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal and;

Therefore is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent State or local regulations): Section 405 of the Clean Water Act, the Solid Waste Disposal Act (SWDA) (including title II, more commonly referred to as the Resource Conservation and Recovery Act (RCRA), and including State regulations contained in any State sludge management plan prepared pursuant to subtitle D of the SWDA), sludge regulations appearing in 40 CFR Part 507, the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection, Research and Sanctuaries Act.

Major Facility--A facility discharging to surface water with an EPA rating score of > 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Maximum Daily Discharge Limitation--The highest allowable daily discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. The daily discharge is calculated as the average measurement of the pollutant over the day.

Method Detection Level (MDL)--The minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is above zero and is determined from analysis of a sample in a given matrix containing the analyte.

Minor Facility--A facility discharging to surface water with an EPA rating score of < 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Mixing Zone--A volume that surrounds an effluent discharge within which water quality criteria may be exceeded. The area of the authorized mixing zone is specified in a facility's permit and follows procedures outlined in State regulations (Chapter 173-201A WAC).

National Pollutant Discharge Elimination System (NPDES)--The NPDES (Section 402 of the Clean Water Act) is the Federal wastewater permitting system for discharges to navigable waters of the United States. Many states, including the State of Washington, have been delegated the authority to issue these permits. NPDES permits issued by Washington State permit writers are joint NPDES/State permits issued under both State and Federal laws.

Pass through -- A discharge which exits the POTW into waters of the-State in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation), or which is a cause of a violation of State water quality standards.

pH--The pH of a liquid measures its acidity or alkalinity. A pH of 7 is defined as neutral, and large variations above or below this value are considered harmful to most aquatic life.

Potential Significant Industrial User--A potential significant industrial user is defined as an Industrial User which does not meet the criteria for a Significant Industrial User, but which discharges wastewater meeting one or more of the following criteria:

a. Exceeds 0.5 % of treatment plant design capacity criteria and discharges <25,000 gallons per day or;

b. Is a member of a group of similar industrial users which, taken together, have the potential to cause pass through or interference at the POTW (e.g. facilities which develop photographic film or paper, and car washes).

The Department may determine that a discharger initially classified as a potential significant industrial user should be managed as a significant industrial user.

Quantitation Level (QL)-- A calculated value five times the MDL (method detection level).

Significant Industrial User (SIU)--
1) All industrial users subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR Chapter I, Subchapter N and;

2) Any other industrial user that: discharges an average of 25,000 gallons per day or more of process wastewater to the POTW (excluding sanitary, noncontact cooling, and boiler blow-down wastewater); contributes a process wastestream that makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the Control Authority* on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement (in accordance with 40 CFR 403.8(f)(6)).

Upon finding that the industrial user meeting the criteria in paragraph 2, above, has no reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement, the Control Authority* may at any time, on its own initiative or in response to a petition received from an industrial user or POTW, and in accordance with 40 CFR 403.8(f)(6), determine that such industrial user is not a significant industrial user.

*The term "Control Authority" refers to the Washington State Department of Ecology in the case of non-delegated POTWs or to the POTW in the case of delegated POTWs.

State Waters--Lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, wetlands, and all other surface waters and watercourses within the jurisdiction of the State of Washington.

Stormwater--That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes, and other features of a storm water drainage system into a defined surface water body, or a constructed infiltration facility.

Technology-based Effluent Limit--A permit limit that is based on the ability of a treatment method to reduce the pollutant.

Total Suspended Solids (TSS)--Total suspended solids are the particulate materials in an effluent. Large quantities of TSS discharged to a receiving water may result in solids accumulation. Apart from any toxic effects attributable to substances leached out by water, suspended solids may kill fish, shellfish, and other aquatic organisms by causing abrasive injuries and by clogging the gills and respiratory passages of various aquatic fauna. Indirectly, suspended solids can screen out light and can promote and maintain the development of noxious conditions through oxygen depletion.

Upset--An exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, lack of preventative maintenance, or careless or improper operation.

Water Quality-based Effluent Limit--A limit on the concentration or mass of an effluent parameter that is intended to prevent the concentration of that parameter from exceeding its water quality criterion after it is discharged into a receiving water.

APPENDIX C -- TECHNICAL CALCULATIONS

Several of the Excel® spreadsheet tools used to evaluate a discharger's ability to meet Washington State water quality standards can be found on the Department's homepage at (http://www.ecy.wa.gov/programs/wq/wastewater/index.html

Chronic Mixing Zone Data

```
AMBIENT PARAMETERS:
  Cross-section                          = bounded
  Width                          BS      = 71.63 m
  Channel regularity             ICHREG  = 1
  Ambient flowrate               QA      = 9.68 m^3/s
  Average depth                  HA      = 0.46 m
  Depth at discharge             HD      = 0.46 m
  Ambient velocity               UA      = 0.2918 m/s
  Darcy-Weisbach friction factor F       = 0.1242
    Calculated from Manning's n          = 0.035
  Wind velocity                  UW      = 1 m/s
Stratification Type              STRCND  = U
  Surface temperature                    = 23.80
 degC
  Bottom temperature                     = 23.80 degC
  Calculated FRESH-WATER DENSITY values:
  Surface density                RHOAS   = 997.3465 kg/m^3
  Bottom density                 RHOAB   = 997.3465 kg/m^3
```

```
-------------------------------------------------------------------------
DISCHARGE PARAMETERS:              Submerged Multiport Diffuser Discharge
  Diffuser type                    DITYPE = unidirectional perpendicular
  Diffuser length                  LD     = 9.14 m
  Nearest bank                            = left
  Diffuser endpoints               YB1    = 24.38 m;    YB2 = 33.53 m
  Number of openings               NOPEN  = 30
  Spacing between risers/openings  SPAC   = 0.32 m
  Port/Nozzle diameter             DO     = 0.0253 m
    with contraction ratio                = 0.6
  Equivalent slot width            BO     = 0.0010 m
  Total area of openings           TAO     = 0.0090 m^2
  Discharge velocity               UO     = 2.74 m/s
  Total discharge flowrate         QO     = 0.024798 m^3/s
  Discharge port height            HO     = 0.09 m
  Nozzle arrangement               BETYPE = unidirectional without fanning
  Diffuser alignment angle         GAMMA  = 90 deg
  Vertical discharge angle         THETA  = 0 deg
  Horizontal discharge angle       SIGMA  = 0 deg
  Relative orientation angle       BETA   = 90 deg
  Discharge temperature (freshwater)      = 23 degC
    Corresponding density          RHOO   = 997.5393 kg/m^3
  Density difference               DRHO   = 1.0758 kg/m^3
  Buoyant acceleration             GPO    = 0.0106 m/s^2
  Discharge concentration          CO     = 0.01 deg.C
  Surface heat exchange coeff.     KS     = 0 m/s
  Coefficient of decay             KD     = 0 /s
-------------------------------------------------------------------------
```

Chronic Mixing Zone

```
********************** REGULATORY MIXING ZONE SUMMARY *********************
The plume conditions at the boundary of the specified RMZ are as follows:
  Pollutant concentration                 = 0.162457  deg.C
Corresponding dilution                    = 43.1
  Plume location:                       x = 91.44 m
    (centerline coordinates)            y = 0 m
                                        z = 0.46 m
  Plume dimensions:                half-width = 5.68 m
                                    thickness = 0.46 m
```

Acute Mixing Zone Data

```
                    CORMIX MIXING ZONE EXPERT SYSTEM
                        CORMIX-GI Version 4.3GT
                     HYDRO2:Version-4.3  April,2004
SITE NAME/LABEL:                Cashmere
  DESIGN CASE:                  Cashmere Dilution Factors
  FILE NAME:                    Y:\WPFILES\MARCLEY\CINDY DRAFTS\Cashmere STP\Cashmere.prd
Using subsystem CORMIX2:        Submerged Multiport Diffuser Discharges
  Start of session:             07/11/2005--14:36:55
*******************************************************************************
SUMMARY OF INPUT DATA:
-------------------------------------------------------------------------------
AMBIENT PARAMETERS:
  Cross-section                         = bounded
  Width                         BS      = 71.63 m
  Channel regularity            ICHREG  = 1
  Ambient flowrate              QA      = 9.68 m^3/s
  Average depth                 HA      = 0.46 m
  Depth at discharge            HD      = 0.46 m
  Ambient velocity              UA      = 0.2918 m/s
  Darcy-Weisbach friction factor F      = 0.1242
    Calculated from Manning's n         = 0.035
  Wind velocity                 UW      = 1 m/s
Stratification Type             STRCND  = U
  Surface temperature                   = 17.90
 degC
  Bottom temperature                    = 17.90 degC
  Calculated FRESH-WATER DENSITY values:
  Surface density               RHOAS   = 998.6151 kg/m^3
  Bottom density                RHOAB   = 998.6151 kg/m^3
-------------------------------------------------------------------------------

DISCHARGE PARAMETERS:           Submerged Multiport Diffuser Discharge
  Diffuser type                 DITYPE  = unidirectional perpendicular
  Diffuser length               LD      = 9.14 m
  Nearest bank                          = left
  Diffuser endpoints            YB1     = 24.38 m;     YB2 = 33.53 m
  Number of openings            NOPEN   = 30
  Spacing between risers/openings SPAC  = 0.32 m
  Port/Nozzle diameter          DO      = 0.0253 m
    with contraction ratio              = 0.6
  Equivalent slot width         BO      = 0.0010 m
  Total area of openings        TAO      = 0.0090 m^2
  Discharge velocity            UO      = 3.95 m/s
  Total discharge flowrate      QO      = 0.035751 m^3/s
  Discharge port height         HO      = 0.09 m
  Nozzle arrangement            BETYPE  = unidirectional without fanning
  Diffuser alignment angle      GAMMA   = 90 deg
  Vertical discharge angle      THETA   = 0 deg
  Horizontal discharge angle    SIGMA   = 0 deg
  Relative orientation angle    BETA    = 90 deg
  Discharge temperature (freshwater)    = 25 degC
    Corresponding density       RHOO    = 997.0456 kg/m^3
  Density difference            DRHO    = 1.5696 kg/m^3
  Buoyant acceleration          GPO     = 0.0154 m/s^2
  Discharge concentration       CO      = 7.1 deg.C
  Surface heat exchange coeff.  KS      = 0 m/s
  Coefficient of decay          KD      = 0 /s
```

Acute Mixing Zone

```
********************* REGULATORY MIXING ZONE SUMMARY **********************
The plume conditions at the boundary of the specified RMZ are as follows:
  Pollutant concentration                 = 0.175197  deg.C
Corresponding dilution                    = 40.5
  Plume location:                       x = 9.14 m
    (centerline coordinates)            y = 0 m
                                        z = 0.46 m
  Plume dimensions:               half-width = 5.34 m
                                   thickness = 0.46 m
```

Visual Plumes Acute Dilution Factor

Diffuser, Flow, Mixing Zone Inputs

Port diameter	n/r	Port elevation	Vertical angle	Hor angle	Num of ports	Port spacing	n/r	n/r	n/r	Acute mix zone	Chronic mix zone	Port depth	Effluent flow	Effluent salinity(*)	Effluent temp	Effluent conc
in	m	in	deg	deg		ft	s	s	s	ft	ft	ft	MGD	psu	C	ppb
1		8	0	90	30	2				30	300	1.5	0.816	0.001	25	10

Ambient Inputs

	Measurement depth or height	Near-field current speed	Near-field current dir.	Ambient salinity(*)	Ambient temperature	Background concentration	Pollutant decay rate(*)	n/r	n/r	Far-field diffusion coeff
Depth or Height		depth	depth	depth	depth	depth	depth	depth	depth	depth
Extrapolation (sfc)		constant	constant	constant	constant	constant	constant	constant	constant	constant
Extrapolation (btm)		constant	constant	constant	constant	constant	constant	constant	constant	constant
Measurement unit	m	ft/s	deg	psu	C	ppb	s-1	m/s	deg	m0.67/s2
	0	0.48	0	0.001	20	1	0.001			0
	1.5	0.48	0	0.001	20	1	0.001			0

```
Simulation:
Froude number:      138.2; effluent density (sigma-T) -2.89197126; effluent velocity     2.352(m/s);
        Depth  Amb-cur    P-dia  Polutnt   Dilutn  CL-diln   x-posn   y-posn
Step     (ft)   (ft/s)     (in)    (ppb)       ()       ()     (ft)     (ft)
   0      1.5    0.48      1.0     10.0      1.0      1.0      0.0      0.0;
 153    1.498    0.48    15.97    1.453    19.84    12.81    0.557    1.312; merging;
 154    1.497    0.48    16.14    1.446    20.11    13.03    0.584    1.334; bottom hit;
 181    1.455    0.48    35.63    1.265    33.65    27.68    3.846    3.364; surface;
 190    1.426    0.48    50.28    1.221    40.22    33.64    5.353    4.034; matched energy radial vel =  0.113m
 234    0.571    0.48    144.3    1.089    96.13    87.58    29.23    9.789; acute zone;
 311   -7.555    0.48    665.9    1.017    441.6    432.6    176.1    20.24; stream limit reached;
```

Visual Plumes Chronic Dilution Factor

Diffuser, Flow, Mixing Zone Inputs

Port diameter	n/r	Port elevation	Vertical angle	Hor angle	Num of ports	Port spacing	n/r	n/r	n/r	Acute mix zone	Chronic mix zone	Port depth	Effluent flow	Effluent salinity(*)	Effluent temp	Effluent conc
in	m	in	deg	deg		ft	s	s	s	ft	ft	ft	MGD	psu	C	ppb
1		8	0	90	30	2				30	300	1.5	0.566	0.001	25	10

Ambient Inputs

	Measurement depth or height	Near-field current speed	Near-field current dir.	Ambient salinity(*)	Ambient temperature	Background concentration	Pollutant decay rate(*)	n/r	n/r	Far-field diffusion coeff
Depth or Height		depth	depth	depth	depth	depth	depth	depth	depth	depth
Extrapolation (sfc)		constant	constant	constant	constant	constant	constant	constant	constant	constant
Extrapolation (btm)		constant	constant	constant	constant	constant	constant	constant	constant	constant
Measurement unit	m	ft/s	deg	psu	C	ppb	s-1	m/s	deg	m0.67/s2
	0	0.48	0	0.001	20	1	0.001			0
	1.5	0.48	0	0.001	20	1	0.001			0

```
Simulation:
Froude number:      95.83; effluent density (sigma-T) -2.89197126; effluent velocity     1.631(m/s);
        Depth   Amb-cur    P-dia  Polutnt   Dilutn  CL-diln   x-posn   y-posn
Step     (ft)   (ft/s)     (in)    (ppb)       ()       ()     (ft)     (ft)
   0      1.5     0.48      1.0     10.0      1.0      1.0      0.0      0.0;
 150    1.498     0.48    13.41    1.494    18.18     10.8    0.526    0.981; merging;
 160     1.49     0.48    16.37    1.412    21.76    14.43    1.407    1.491; bottom hit;
 183    1.436     0.48    35.24    1.259    34.32    27.82     4.58    2.816; surface;
 195    1.296     0.48    45.24    1.203    43.53    36.36    9.506    4.249; matched energy radial vel =  0.108m
 228     0.41     0.48    87.78    1.102    83.67    75.25    28.96    7.835; acute zone;
 331    -13.7     0.48    672.5    1.013    643.2    633.6    267.1    17.55; stream limit reached;
```

Mass Balance Dilution Calculation

344	7Q10 cfs - Wenatchee River at Cashmere
86	25 % of 7Q10 cfs
0.865	Max Monthly Flow (cfs) 2001 - 2004
100.4	Cashmere's Chronic Dilution Mass Balance Dilution Factor

RIVPLUM Dilution
Calculation

Spread of a plume from a point source in a river with boundary effects from the shoreline		
based on the method of Fischer *et al.* (1979) with correction for the effective origin of effluent.		
Revised 22-Feb-96		
INPUT		
	ACUTE	CHRONIC
1. Effluent Discharge Rate (cfs):	1.34	0.877
2. Receiving Water Characteristics Downstream From Waste Input		
Stream Depth (ft):	1.52	1.52
Stream Velocity (fps):	0.96	0.96
Channel Width (ft):	235.00	235.00
Stream Slope (ft/ft) or Manning roughness "n":	0.035	0.035
0 if slope or 1 if Manning "n" in previous cell:	0	0
3. Discharge Distance From Nearest Shoreline (ft):	100	100
4. Location of Point of Interest to Estimate Dilution		
Distance Downstream to Point of Interest (ft):	30	300
Distance From Nearest Shoreline (ft):	100	100
5. Transverse Mixing Coefficient Constant (usually 0.6):	0.6	0.6
6. Original Fischer Method (enter 0) or *Effective Origin* Modifi	0	0
OUTPUT		
1. Source Conservative Mass Input Rate		
Concentration of Conservative Substance (%):	100.00	100.00
Source Conservative Mass Input Rate (cfs*%):	134.00	87.70
2. Shear Velocity		
Shear Velocity based on slope (ft/sec):	1.309	1.309
Shear Velocity based on Manning "n":		
using Prasuhn equations 8-26 and 8-54 assuming		
hydraulic radius equals depth for wide channel		
Darcy-Weisbach friction factor "f":	#N/A	#N/A
Shear Velocity from Darcy-Weisbach "f" (ft/sec):	#N/A	#N/A
Selected Shear Velocity for next step (ft/sec):	1.309	1.309
3. Transverse Mixing Coefficient (ft2/sec):	1.194	1.194

3. Transverse Mixing Coefficient (ft2/sec):	1.194		1.194
4. Plume Characteristics Accounting for Shoreline Effect (Fischer *et al.* , 1979)			
Co	3.91E-01		2.56E-01
x'	6.75E-04		6.75E-03
y'o	4.26E-01		4.26E-01
y' at point of interest	4.26E-01		4.26E-01
Solution using superposition equation (Fischer eqn 5.9)			
Term for n= -2	0.00E+00		6.48E-258
Term for n= -1	0.00E+00		5.05E-65
Term for n= 0	1.00E+00		1.00E+00
Term for n= 1	6.47E-213		6.04E-22
Term for n= 2	0.00E+00		4.08E-160
Upstream Distance from Outfall to *Effective Origin* of Efflu	#N/A		#N/A
Effective Distance Downstream from Effluent to Point of Int	30.00		300.00
x' Adjusted for *Effective Origin*	6.75E-04		6.75E-03
C/Co (dimensionless)	1.09E+01		3.43E+00
Concentration at Point of Interest (Fischer Eqn 5.9)	4.24E+00		8.78E-01
Unbounded Plume Width at Point of Interest (ft)	34.549		109.254
Unbounded Plume half-width (ft)	17.275		54.627
Distance from near shore to discharge point (ft)	100.00		100.00
Distance from far shore to discharge point (ft)	135.00		135.00
Plume width bounded by shoreline (ft)	34.55		109.25
Approximate Downstream Distance to Complete Mix (ft):	5,863		5,863
Theoretical Dilution Factor at Complete Mix:	255.904		391.006
Calculated Flux-Average Dilution Factor Across Entire Plun	37.623		181.784
Calculated Dilution Factor at Point of Interest:	23.576		113.916

REASONABLE POTENTIAL

This spreadsheet calculates the reasonable potential to exceed state water quality standards for a small number of samples. The procedure and calculations are done per the procedure in Technical Support Document for Water Quality-based Toxics Control, U.S. EPA, March, 1991 (EPA/505/2-90-001) on page 56. User input columns are shown with red headings. Corrected formulas in col G and H on 5/98 (GB)

This spreadsheet calculates the reasonable potential to exceed state water quality standards for a small number of samples. The procedure and calculations are done per the procedure in Technical Support Document for Water Quality-based Toxics Control, U.S. EPA, March, 1991 (EPA/505/2-90-001) on page 56. User input columns are shown with red headings. Corrected formulas in col G and H on 5/98 (GB)

CALCULATIONS

				State Water Quality Standard		Max concentration at edge of...											
	Metal Criteria Translator as decimal	Metal Criteria Translator as decimal	Ambient Concentration (metals as dissolved)	Acute	Chronic	Acute Mixing Zone	Chronic Mixing Zone	LIMIT REQ'D?	Effluent percentile value		Max effluent conc. measured (metals as total recoverable)	Coeff Variation		# of samples	Multiplier	Acute Dil'n Factor	Chronic Dil'n Factor
Parameter	Acute	Chronic	ug/L	ug/L	ug/L	ug/L	ug/L			Pn	ug/L	CV	s	n			
AMMONIA	0.95	0.95	53.0000	4500.0000	730.0000	934.01	235.54	NO	0.95	0.779	13500.00	0.60	0.55	12	1.63	24	114
CHLORINE	0.95	0.95	0.0010	19	11	2.30	0.48	NO	0.95	0.920	50.00	0.60	0.55	36	1.14	24	114

CRITICAL SEASON TEMPERATURE CALCULATIONS
Class A Stream

The allowable incremental temperature increase at the edge of the chronic mixing zone, when stream temperatures are at or below 18ºC is: Maximum temperature increase shall not be greater than 2.8ºC due to human activities at any time or:

$$T_{limit} = 28/ (18\ T_{max\ ambient\ temp} + 7)$$

T_{LIMIT} = 1.12ºC RISE

When natural conditions exceed 18ºC no increase at the edge of the chronic mixing zone greater than **0.3 ºC** is allowed. The most restrictive model predicts a 0.16ºC rise < either a 1.12ºC or a 0.3ºC rise.

```
********************* REGULATORY MIXING ZONE SUMMARY *********************
The plume conditions at the boundary of the specified RMZ are as follows:
  Pollutant concentration                = 0.162457  deg.C
Corresponding dilution                   = 43.1
  Plume location:                      x = 91.44 m
    (centerline coordinates)           y = 0 m
                                       z = 0.46 m
  Plume dimensions:              half-width = 5.68 m
                                  thickness = 0.46 m
```

State Modeling. USEPA Office of Water, Washington D.C.)

Based on Lotus File PHMIX2.WK1 Revised 19-Oct-93

INPUT	
1. DILUTION FACTOR AT MIXING ZONE BOUNDARY	23.600
1. UPSTREAM/BACKGROUND CHARACTERISTICS	
Temperature (deg C):	23.80
pH:	8.20
Alkalinity (mg CaCO3/L):	17.30
2. EFFLUENT CHARACTERISTICS	
Temperature (deg C):	25.00
pH:	9.00
Alkalinity (mg CaCO3/L):	0.00

OUTPUT	
1. IONIZATION CONSTANTS	
Upstream/Background pKa:	6.36
Effluent pKa:	6.35
2. IONIZATION FRACTIONS	
Upstream/Background Ionization Fraction:	0.99
Effluent Ionization Fraction:	1.00
3. TOTAL INORGANIC CARBON	
Upstream/Background Total Inorganic Carbon (mg CaCO3/L):	17.55
Effluent Total Inorganic Carbon (mg CaCO3/L):	0.00
4. CONDITIONS AT MIXING ZONE BOUNDARY	
Temperature (deg C):	23.85
Alkalinity (mg CaCO3/L):	16.57
Total Inorganic Carbon (mg CaCO3/L):	16.80
pKa:	6.36
pH at Mixing Zone Boundary:	8.20

APPENDIX D -- RESPONSE TO COMMENTS

No comments were received by the Department of Ecology.